REMARKS

With this Preliminary Amendment, a minor error has been corrected in claim 1 and claim 9 has been amended to describe alternative biasing components that can be used to apply the bias magnetic field. Entry of the Amendment prior to the first official action and consideration of the application as amended is respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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MARKED-UP VERSION OF REPLACEMENT CLAIMS

1. (Twice Amended) A spin valve sensor for use with a data storage system to produce a giant magnetoresistive (GMR) effect in response to applied magnetic fields, the sensor comprising:

a sense current (I), which is horizontally oriented in a longitudinal direction;

a first ferromagnetic free layer having a magnetization (M_1) in a first direction that is aligned in the longitudinal direction of the sense current, when the first ferromagnetic free layer is in a quiescent state;

a second ferromagnetic free layer having a magnetization (M_2) in a second direction that is anti-parallel to the first direction, when the second ferromagnetic free layer is in a quiescent state;

a spacer layer between the first and second ferromagnetic free layers; and

a permanent magnet positioned above the first and second ferromagnetic free layers opposite an air bearing surface (ABS) and producing a bias magnetic~~zation~~ field that biases both M_1 and M_2 in a third direction that is transverse to the first and second directions thereby establishing quiescent bias states for M_1 and M_2;

wherein M_1 produces a first demagnetization field that biases M_2 in the second direction and M_2 produces a second demagnetization field that biases M_1 in the first direction when the first and second ferromagnetic free layers are in their quiescent states, and M_1 and M_2 rotate about their quiescent bias states in response to an applied magnetic

field thereby producing a GMR effect in the sensor as a function of the rotation of M_1 and M_2.

9. (Amended) A method of sensing an applied magnetic field, comprising steps of:

(a) providing a first ferromagnetic free layer having a magnetization (M_1) in a first direction that is aligned with a sense current (I) in a longitudinal direction, when in a quiescent state;

(b) providing a second ferromagnetic free layer having a magnetization (M_2) in a second direction that is anti-parallel to the first direction, when in a quiescent state;

(c) applying a bias magnetic field to the first and second ferromagnetic free layers with a biasing component thereby angling M_1 and M_2 toward a third direction that is transverse to the first and second directions and establishing a quiescent bias state, wherein the biasing component is either a permanent magnet positioned above the first and second ferromagnetic free layers opposite an air bearing surface, or a first anti-ferromagnetic layer exchange coupled to the first ferromagnetic free layer and a second anti-ferromagnetic layer exchange coupled to the second ferromagnetic free layer; and

(d) allowing M_1 and M_2 to rotate about their quiescent bias states in response to an applied magnetic field whereby a GMR effect is produced as a function of the rotation of M_1 and M_2.